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**THE SUBGENUS STYLURUS NEEDHAM: SELYS'
GROUPS VI AND VII OF THE GENUS GOM-
PHUS (ODONATA), AND ON THE POST-
ANAL CELLS IN THE LATTER.**

BY E. B. WILLIAMSON.

Size medium or large; thorax normally dark with paler markings; a pale stripe between the mid-dorsal carina and the humeral suture, isolated, not continuous above or below with other pale areas; in adults the general color of thorax and abdomen is a very dark reddish brown or black (excepting in *plagiatus*, where the thorax is somewhat lighter and the abdomen is brown), while the pale thoracic markings are bluish green in color (in teneralis yellow or greenish yellow). Front wings with two posttriangular cells (in *scudderi* usually, and in other species frequently, three in the first row); the branches of the anal vein normally enclosing first two open cells followed by two rows; the first postanal cell* irregular in form, its length about one and one half times its maximum width, one side formed by the second branch of the anal vein, which branch is distinctly angulated where it is met by the vein separating the first and second postanal cells; portion of anal vein bounding the first postanal cell longer than the portion of the second branch of the anal vein bounding the same cell; pterostigma ordinary or long.

♂.—First hamule slender, simple, partly or entirely concealed by the second, not unguiculated; second hamule laminate, as seen in profile tapering to an acute apex; sheath of penis large, rounded. Superior abdominal appendages widely divaricate, seen in profile the upper edge not as convex as in related species (*fraternus*, *crassus* and the *dilatatus* group), beyond the middle the outer side bevelled away to the apex, the bevelled portion with a narrow externo-ventral shelf with a crenulate margin; inferior appendage with its branches about equally or slightly more divergent than the superiors.

* The cells enclosed between these two branches of the anal vein may be called the *postanal cells*, thus avoiding any confusion with the *anal triangle* of authors; they make up the middle one of the three postcostal areas.

♀.—Frontal vesicle tuberculate, curving behind each lateral ocellus and ending there, or continued posteriorly, in which case each extremity is produced into a spine; the carina enclosing the vesicle thickened and produced on either side to form a spine between the lateral ocellus and the eye, this spine apparently correlated with a small dorsal subapical hemispherical excavation on each branch of the inferior appendage of the male. Vulvar lamina from very short to about one-fifth as long as the sternum of 9. Appendages longer than 10, acute. I have been unable to find a character which isolates the females in question as well as the males are isolated by the form of their superior abdominal appendages. The frontal vesicle, as in *amnicola*, *notatus* and *plagiatus*, is similar to certain other species in the genus. The posterior spines of *scudderi* and *spiniceps* are better developed in *brevis*; in copulation they would overlap the internal edges of the branches of the inferior appendage of the male. The lateral spine between the lateral ocellus and the eye is common to the genus, though in such species as *spicatus* and *exilis* it is reduced to the merest vestige. In general, in both sexes, the eyes are more approximated than usual in the genus, the vertex meets the frons in a very obtuse angle, the angle of the frons is rounded and low, and the occipital crest is low, but such characters, indefinite as they are, can hardly be used in isolating the group.

Professor Needham (Canadian Entomologist, vol. xxix, No. 7, pp. 167 and 177) has characterized the nymphs of *notatus*, *spiniceps* and *plagiatus* as follows: "Wing cases laid parallel along the back; third joint of antennæ cylindric, at least twice as long as wide; abdominal appendages longer than the 10th segment; front border of median lobe of labium straight, with the usual fringe of flat scales, but without teeth; abdomen not abruptly narrowed before the 9th segment; body spindle shaped, little flattened; fore and middle tibiæ with small external apical hooks, or with none; ninth abdominal segment one half longer than the eighth, its lateral margins nearly parallel; a minute mid-dorsal apical spine on the 9th segment only; lateral lobe of the labium with a strongly incurved end hook and teeth on the inner margin increasing in size posteriorly."

So far as known to myself the nymphs of the five species of this subgenus live only in running water, with the exception of *plagiatus* which is found in both flowing and still water.

1. Abdominal segment 8 longer than 9.* ♂.—Segments 7-9 greatly dilated; second hamule forked. ♀.—Vulvar lamina not shorter than one-seventh the sternum of 9.....2.
Abdominal segment 8 shorter than 9.* ♂.—Segments 7-9 slightly dilated; second hamule simple. ♀.—Vulvar lamina shorter than one-seventh the sternum of 9.....3.
2. Segments 3-7 with a maculose longitudinal mid-dorsal stripe...**annicola**.
Segments 3-7 basally annulate with yellow**scudderi**.
3. Abdomen black, marked with yellow or green.....4.
Abdomen yellowish brown, marked with yellow or green; labrum largely green, no distinct markings**plagiatus**.
4. Abdominal segments 7 and 9 about equal in length; labrum with the margins and a more or less distinct central spot, yellowish.....**spiniceps**.
Abdominal segment 9 shorter than 7; labrum with the margins and a longitudinal median stripe (rarely reduced to a central spot), black..**notatus**.

In listing the material examined of each species, mention is made of those persons and institutions to whom my thanks are due for the loan of specimens. At the Acad. Nat. Sci., Phil., I am indebted to Dr. Calvert; at the U. S. Nat. Mus., to Mr. Currie; at the M. C. Z., to Mr. Henshaw; and at Ohio State University, to Mr. Hine. Measurements, descriptions and notes given under each species have been made from material examined by myself, unless otherwise stated, and have no reference to hitherto published accounts of these species.

1. **Gomphus annicola** Walsh., Proc. Acad. Phil., p. 396, 1862.

Ab. ♂ 35; ♀ 35-36; H. w. ♂ 29-31; ♀ 33.

Antecub. f. w. 11-14; h. w. 7-11.

Postcub. f. w. 7-12; h. w. 8-12.

Face yellowish, labrum margined with black, rarely an indistinct median spot of same color; anteclypeus dark or pale; lower lateral edges of postclypeus more or less black, usually the lateral depressions also dark; suture between frons and clypeus, and frons above at base, black. Mesothoracic half-collar not interrupted, continuous with the pale area of the mid-dorsal carina, which includes the carina itself and usually a little on either side; dorsal stripes isolated, strongly convergent above, in one specimen continuous above with the pale of the mid-dorsal carina area; antehumeral pale stripe interrupted above and rarely also at other points; humeral and first lateral suture each with a black stripe, the latter interrupted above or more rarely complete. Abdomen with a maculose longitudinal mid-dorsal stripe. Legs black, first femora brown beneath, and last femora pale dorsally; in teneral all the femora are pale and the tibiae and tarsi brown.

♂.—Accessory genitalia of 2 black; sides of 8 and 9 each with a large yellow blotch; 10 and appendages black or very dark.

♀.—Abdominal segments laterally conspicuously marked with yellow; 8 and 9 scarcely dilated; vulvar lamina in length one-fourth to one-fifth sternum of 9.

*A character by no means always clearly evident in dried specimens; excepting for *spiniceps*, it may be generally said in this group that 8 and 9 are about equal.

MATERIAL EXAMINED.

1 ♂, 1 ♀, Rock Island, Illinois; each labelled "Type;" ♂ with last 7 abdominal segments gone. U. S. Nat. Mus.

1 ♂, 1 ♀, Rock Island, Illinois. M. C. Z.

1 ♂, Galina, Illinois; Mr. Bean, collector. M. C. Z.

1 ♂, Bethlehem, N. Y.; July 6, 1870; Lintner collection. M. C. Z.

This species has also been reported from Iowa.

2. **Gomphus scudderi** Selys. Trois. Add. Syn. Gomph., p. 24 (or 752), 1873.

Ab. ♂ 43; ♀ 42-43. H. w. ♂ 34-35; ♀ 36-37.

Antecub. f. w. 14-15; h. w. 10-11.

Postcub. f. w. 11-12; h. w. 9-11.

Face olive or yellow (♀); labrum clear green or yellow (♀), margined with black, with or without trace of a median spot or longitudinal stripe; anteclypeus brown; lower half of frons in front, suture between frons and clypeus, lateral depressions and lower lateral edges of post-clypeus, and frons above at base, black. Mesothoracic half-collar interrupted in the middle; mid-dorsal carina black; dorsal stripes isolated; antehumeral pale stripe widely interrupted above, reduced to a short line below and a spot above; humeral and lateral sutures each with a complete stripe; the humeral and first lateral stripe enclose a parallel-sided pale area about as wide as the humeral stripe; pale area between the two lateral stripes reduced, interrupted above. Legs black; first femora, and to a lesser extent the second, paler beneath; third femora black or yellow basally. Abdomen with 3-7 basally annulate with yellow.

♂.—Accessory genitalia of 2 blackish; second hamule similar to that of *G. amnicola*; 8 and 9 each with a small dorsal basal spot and a larger irregular lateral basal one; 10 and appendages black.

♀.—Spines on vesicle of frons placed more closely to the lateral ocelli than in *G. spiniceps*; lateral spines short, conical. Abdominal segments 2-9 laterally conspicuously marked with yellow; 7-9 very slightly dilated; vulvar lamina in length about one-sixth the length of the sternum of 9. The vulvar lamina of the female of this species loaned me by Dr. Calvert differs from the specimen figured by the two thickened areas being more contiguous and with a thinner membranous area basally on either side, as well as between them; the outline of the lamina is the same in both cases.

MATERIAL EXAMINED.

2 ♂, Russell Stream, Northeast Carry, Maine; August 29, 1899; F. L. Harvey, collector. E. B. Williamson.

1 ♀, Northeast Carry, Maine; August 29, 1899; F. L. Harvey, collector. Ohio State University.

1 ♀, Russell Stream, September 27, 1899; F. L. Harvey, collector. Dr. P. P. Calvert.

Selys' type of this species may possibly have been taken in Massachusetts or New Hampshire.

3. *Gomphus spiniceps* Walsh. (*Macrogomphus?* s.), Proc. Acad. Phil., p. 389, 1862.

Ab. ♂ 46-49; ♀ 48-52. H. w. ♂ 35-37; ♀ 38-40.

Antecub. f. w. 15-17; h. w. 10-12.

Posteub. f. w. 11-13; h. w. 11-14.

Face brown, sometimes slightly paler (greenish) at the sutures; edges of labrum and a more or less distinct small central spot, yellowish, its base greenish; frons above greenish, little or not interrupted in the middle by the brown of the basal half. Mesothoracic half-color interrupted; mid-dorsal carina black; dorsal stripes isolated; antehumeral stripe interrupted to form a spot above and a line below, on one side in one specimen and on both sides in another the two connected; a straight, parallel-sided pale area between the humeral and first lateral stripes; two lateral stripes, the enclosed pale area narrower than either and constricted or interrupted above. Abdomen with a much reduced maculose longitudinal mid-dorsal stripe. Legs black, paler basally, first femora brown beneath.

♂.—Accessory genitalia of 2 blackish; second hamule longer than in any other species of the group, simple, curved forwards, the apical third directed anteriorly; segments 7-9 slightly dilated, about as in *notatus* and *plagiatus*; sides of 8 and 9 greenish, with reddish tinges, the extreme edges black; 10 and the appendages black or very dark.

♀.—There is great variation in the development of the spine on either side between each lateral ocellus and the eye; it may be very distinct, or hardly discernable, though a thickening of the carina at that point is evident. In the same way the crest of the occiput varies in different specimens in a way that can hardly be explained by shrinkage in drying; it is emarginate at the center, and on either side of this may be a low uniformly convex edge, or it may be as shown in the drawing (plate viii). Abdomen more robust than in the male; 8 and 9 scarcely dilated, colored about as in the male, edge of 9 entirely pale; 3-7 with conspicuous lateral spots; vulvar lamina about one-twentieth as long as the sternum of 9.

MATERIAL EXAMINED.

2 ♂, Ohio; 1 ♀, Akron, Ohio; September 26, 1897; J. S. Hine, collector. Ohio State University.

1 ♂, Ohio; J. S. Hine, collector. U. S. Nat. Mus.

1 ♂ (type of *Stylurus segregans* Needham), Quiver Creek, Havana, Illinois; June 23, 1896. Professor Needham.

1 ♀, Horton's Ford, Tennessee; August 14, 1899. C. C. Adams.

1 ♀, Clinch River P. O., Tennessee; Aug. 14, 1899. C. C. Adams.

1 ♂, 1 ♀, Allegheny River, Pittsburg, Pa.; July 4, 1899. E. B. Williamson.

1 ♂, Bethlehem, N. Y.; September 14, 1870; Lintner collection. M. C. Z.

1 ♂, Albany, N. Y. M. C. Z.

This species is also recorded for Massachusetts.

4. **Gomphus notatus** Rambur. Ins. Névr., p. 162, 1842.

Ab. ♂ 40-42; ♀ 41-43. H. w. ♂ 32-33; ♀ 33-34.

Antecub. f. w. 12-16; h. w. 10-12.

Postcub. f. w. 8-11; h. w. 7-10.

Face pale greenish brown (tenerals) to obscure brown; labrum greenish bordered with black and with a wide median stripe of the same color; anteclypeus dark, with the depressions of the postclypeus also dark (♂), or anteclypeus paler, only the slightly darker markings present (♀); front in frons dark reddish brown (♂), or the same color as the postclypeus (♀); above greenish, basal half reddish brown which is produced in the middle in front, usually interrupting the greenish area; eyes in life green above, gray below. Mesothoracic half-collar usually but not always narrowly interrupted at the middle; mid-dorsal carina black, or with the extreme edge yellowish; dorsal stripes isolated; antehumeral stripe slightly constricted above; humeral and two lateral sutures each with a complete dark stripe, the humeral the widest. Abdomen with a much reduced maculose longitudinal mid-dorsal stripe. Legs black, first femora paler beneath; in tenerals the femora are pale, darker apically and on the upper surface.

♂.—Accessory genitalia blackish; second hamule slender, simple, not turned forwards; coloration of last segments and dilation of 7-9 as in *spiniceps*.

♀.—In the form of the crest of the occiput and the variation in the development of the spine between each lateral ocellus and eye, the same that has been said for *spiniceps* holds here; two forms of occipital crests are figured. Abdominal segments 8 and 9 scarcely dilated, colored about as in *spiniceps*; vulvar lamina about one-twentieth as long as sternum of 9, or less.

In one male (Rock Island, Illinois; Walsh. M. C. Z.), doubtless studied by Hagen (Quatr. Add. Syn. Gomph., p. 61, or 466), the median longitudinal stripe of the labrum is represented by only a median spot. In this teneral specimen the whole face is pale, only frons above in front slightly darker, and lateral depressions of the postclypeus and margins of labrum, black. This description of labrum applies also to a female type of Walsh's *fluvialis* in the U. S. Nat. Mus. It is probably to be largely explained by the fading of these teneral specimens. The material from Ironton, Ohio, all teneral, does not so vary, however.

MATERIAL EXAMINED.

3 ♂, 2 ♀, Ironton, Ohio; June 1, 1899. R. C. Osburn.

3 ♂, 3 ♀, Ironton, Ohio; June 1, 1899; J. S. Hine, collector. Ohio State University.

1 ♂, 1 ♀, Ironton, Ohio; June 1, 1899; R. C. Osburn, collector. E. B. Williamson.

2 ♂, 1 ♀, Cumberland River, Nashville, Tennessee; September 30, 1900. E. B. Williamson.

1 ♀, Niles, Michigan; June 21, 1894; Healy, collector. James Tough.

1 ♂, Illinois. C. C. Adams.

1 ♂, 2 ♀, Rock Island, Illinois; Walsh. M. C. Z.

1 ♂, 1 ♀, Rock Island, Illinois, "types" of *fluvialis*; last seven abdominal segments of ♀ gone. U. S. Nat. Mus.

This species is also reported from Quebec, Canada.

5. **Gomphus plagiatus** Selys. Syn. Gomph., p. 38 (or 57), 1854.

Ab. ♂ 44-46; ♀ 43-44. H. w. ♂ 34-36; ♀ 36-37.

Antecub. f. w. 13-14; h. w. 10-11.

Postcub. f. w. 9-11; h. w. 9-11.

Face in adults brown, greenish below, no very distinct markings; labrum largely green; frons above bluish green, brown at base; in young specimens the face is yellow; eyes in life grass-green above, below yellowish green. Mesothoracic half-collar scarcely or not interrupted; edge of mid-dorsal thoracic carina yellow; dorsal stripes normally isolated (in a male, Sandusky, Ohio, July 9, 1899, R. C. Osburn, collector, in my collection), the dorsal pale stripes widen below, and are continuous with the mesothoracic half-collar, and narrowly continuous above with the antehumeral pale areas; second lateral stripe interrupted near its upper end. In other respects, this unusual specimen is normal in coloration. In a few other specimens the dorsal stripes approach very nearly or are continuous, perhaps on only one side, with the half-collar. It may be noticed that in the case of *amnicola*, where the dorsal stripes are not entirely isolated above, they are continuous with the mid-dorsal area; the Sandusky specimen of *plagiatus*, on the other hand, has the dorsal stripes continuous with the antehumeral stripes; antehumeral pale stripes as wide as dorsal stripes, sometimes narrowed a little above; lateral stripes complete (note exception above in case of the Sandusky specimen), only in teneral is the first one ever apparently incomplete. Abdomen brown or yellowish, a maculose longitudinal mid-dorsal stripe. Femora brown, darker apically; tibiae and tarsi black; femora pale in teneral.

♂.—Accessory genitalia brownish, usually pale; second hamule similar to *notatus* in shape and direction, but not so slender; 7-9 slightly dilated, about as in the two preceding species; 8-10 largely reddish yellow in color, the extreme edges of 8 and 9 black; appendages reddish brown, yellow in teneral.

♀.—Abdominal colors usually indistinct; 8-10 reddish yellow, not so red as in the male, 9 usually the brightest; 8 and 9 very little dilated; vulvar lamina about one-eighth to one-ninth as long as the sternum of 9.

MATERIAL EXAMINED.

1 ♂, Manamuskin, N. J.; September 3, 1900; Daecke, collector. Acad. Nat. Sci. Phila.

1 ♂, 1 ♀, vicinity of Philadelphia, Pa.; Philip Nell, collector. Dr. P. P. Calvert.

1 ♀, Fairmount Park, Pa. Dr. P. P. Calvert.

- 1 ♂, Morton, Pa.; July 17, 1886. Dr. P. P. Calvert.
 2 ♀, Sandusky, Ohio; May 25, 1896. E. B. Williamson.
 7 ♂, 6 ♀, Sandusky, O.; June 17, July 12, 1899. R. C. Osburn.
 2 ♂, 4 ♀, Sandusky, O.; June 19, July 24, 1899; J. S. Hine, collector. Ohio State University.
 3 ♂, 2 ♀, Sandusky, O.; July 9-10, 1896; R. C. Osburn, collector. E. B. Williamson.
 1 ♂, Sandusky, O.; June 28, 1900; J. S. Hine, collector. Ohio State University.
 1 ♂, 1 ♀, Winchester, Ill.; July 12, 1894; F. M. McElfresh, collector. C. C. Adams.
 1 ♂, Bloomington, Ill.; June 29, 1895; M. J. Elrod, collector. C. C. Adams.
 2 ♂, 1 ♀, Havana, Ill.; July 10-17, 1897. C. C. Adams.
 1 ♂, Straw Plains, Tenn.; September 30, 1900. C. C. Adams.
 2 ♂, Cumberland River, Nashville, Tenn.; September 19 and 30, 1900. E. B. Williamson.
 1 ♂, Maryland; 1860; Uhler, collector. M. C. Z.
 1 ♂, 1 ♀, Maryland; Hagen. M. C. Z.
 1 ♂, Marshall Hall, Maryland; June 11, 1899; Wood, collector. U. S. Nat. Mus.
 1 ♂, Bladensburg, Md.; September 10, 1897; H. Barber, collector. U. S. Nat. Mus.
 1 ♂, Richmond, Va.; O. A. Stecker, collector. M. C. Z.
 1 ♂, Washington, D. C.; September 27, 1896. U. S. Nat. Mus.
 1 ♂, Florida. C. C. Adams.
 1 ♂, Florida; Banks. U. S. Nat. Mus.
 1 ♂, 1 ♀, Texas. Acad. Nat. Sci. Phila.
 This species is also known from South Carolina.

SYNONYMIC NOTES.

Stylurus segregans Needham, Canadian Entomologist, Vol. xxix, No. 8, p. 185, 1897. A synonym of *spiniceps*.

Gomphus fluvialis Walsh, Proc. Acad. Phila., p. 394, 1862. As determined by Hagen and Selys (Quatr. Add. Syn. Gomph., pp. 60 and 61, or 465 and 466), this is a synonym of *notatus*. As detected by Hagen (*l. c.*), Walsh in describing his *fluvialis* had one female of *plagiatus*. It was from this female apparently that Walsh described the vulvar lamina of the species.

Gomphus elongatus Selys. Syn. Gomph., p. 39 (or 58), 1854. In Quatr. Add. Syn. Gomph., p. 60 (or 465), 1878, this species is announced as a synonym of *plagiatus*, and the previously expressed opinions of Selys and Hagen that it was *spiniceps* or *notatus* are corrected. Kirby (Syn. Cat.) places it again under *notatus*. It seems to be *plagiatus* for several reasons: color of face; form of occiput; the humeral stripe is not mentioned as being constricted above, as it plainly is in *notatus* and *spiniceps*, being normally interrupted in the latter; and the color of abdomen, as described in the Mon. Gomph., p. 161 (or 421), "the color of the abdomen is almost entirely obscure reddish," clearly indicates *plagiatus*, never being true, so far as I know for *notatus* or *spiniceps*.

Gomphus plagiatus Selys. In Selys' descriptions of this species in the Mon. Gomph., p. 159 (or 419), and the Syn. Gomph., p. 38 (or 57), the size is unusually small (ab. 40; h. w. 30), and the number of postcubitals (8) in front wings is smaller than in any specimen I have examined.

Gomphus olivaceous Selys. Trois. Add. Syn. Gomph., p. 21 (or 749), 1873. Hagen, Rept. U. S. Geol. Sur. Terr., p. 597, 1873. I have been unable to examine specimens of this species, which probably belongs in this subgenus. It is close to *plagiatus*, but is smaller, and Hagen considered them two species.

THE POSTANAL CELLS IN THE GENUS GOMPHUS.

Professor Needham has kindly called my attention to the fact that the cells between the branches of the anal vein might offer a taxonomic character, and, with this idea in mind, in connection with the study of the subgenus *Stylurus*, I have studied specimens of twenty-six North American species and three European species of the genus *Gomphus*. I have examined the specimens above mentioned of *Stylurus*, the U. S. Nat. Mus. collection embracing 197 specimens in addition to the specimens of *Stylurus* above listed, twenty-one specimens of *G. fraternus*, *crassus* and *externus* kindly loaned me by Mr. Adams, and most of the specimens in my own collection—altogether I have tabulated under Figs. 1-6, plate viii, 822 wings. A few wings examined, because of their abnormal character, were not tabulated. With one or two exceptions, these abnormal wings belonged to *G. brevis*. Fig. 3a, pl. viii, is such a wing; it is the only case observed where the postanal cells continue to the margin of the wing as a single row.

Very rarely the first postanal cell is divided by a vein either at right angles to the length of the wing (see dotted line, fig. 1c, plate viii) or parallel to it, and extending from the first branch of the anal vein to the anal vein or to the vein separating the first and second postanal cells (see dotted lines, figs. 1a and 1b, plate viii). This crossing of the first postanal cell would seem to be as rare as the crossing of the triangle in this genus, and rarer than the misplacement of the second thickened antecubital from the fifth to the fourth or sixth.

Following is a list of the species examined with the number of wings of each species similar to figs. 1-6, plate viii.

EUROPEAN SPECIES.

1. *G. pulchellus*, fig. 1a, 2; fig. 1c, 4; fig. 3 (with *s. pa.* divided), 1; fig. 3, 1. Total 8.
2. *G. vulgatissimus*, fig. 2, 4. Total 4.
3. *G. simillimus*, fig. 3 (with *s. pa.* divided), 1; fig. 3, 3. Total 4.

NORTH AMERICAN SPECIES.

4. *G. pallidus*, fig. 1, 2. Total 2.
5. *G. exilis*, fig. 1a, 60; fig. 1b, 33; fig. 3 (with *s. pa.* divided), 7. Total 100.
6. *G. sordidus*, fig. 1a, 9; fig. 1b, 9; fig. 3 (with *sp. a.* divided), 4. Total 22.
7. *G. descriptus*, fig. 1a, 8; fig. 1b, 2; fig. 3 (with *s. pa.* divided), 4; fig. 3, 1. Total 15.
8. *G. spicatus*, fig. 1a, 19; fig. 1b, 13. Total 32.
9. *G. minutus*, fig. 1a, 4; fig. 1b, 3; fig. 3 (with *s. pa.* divided), 1. Total 8.
10. *G. quadricolor*, fig. 1a, 5; fig. 1b, 1; fig. 3 (with *s. pa.* divided), 1. Total 7.
11. *G. viridifrons*, fig. 1b, 5; fig. 3 (with *s. pa.* divided), 2; fig. 3, 1. Total 8.
12. *G. abbreviatus*, fig. 1a, 9; fig. 1b, 16; fig. 1d, 1. Total 26.
13. *G. brevis*, fig. 1a, 91; fig. 1b, 49; fig. 1d, 5; fig. 3 (with *s. pa.* divided), 7; fig. 3, 20; fig. 3a, 1. Total 173.
14. *G. graslinellus*, fig. 1a, 19; fig. 1b, 11; fig. 3, 1. Total 30.
15. *G. militaris*, fig. 1b, 2. Total 2.
16. *G. furcifer*, fig. 1a, 3; fig. 1b, 1. Total 4.
17. *G. villosipes*, fig. 4, 18; fig. 5, 6. Total 24.
18. *G. externus*, fig. 4, 4; fig. 5, 7. Total 11.
19. *G. crassus*, fig. 4, 11; fig. 5, 12. Total 23.
20. *G. fraternus*, fig. 4, 13; fig. 5, 42. Total 53.
21. *G. vastus*, fig. 4, 1; fig. 5, 31. Total 32.
22. *G. dilatatus*, fig. 5, 2. Total 2.
23. *G. amminola*, fig. 5, 12. Total 12.
24. *G. scudderi*, fig. 4, 4; fig. 5, 14. Total 18.
25. *G. spiniceps*, fig. 4, 6; fig. 5, 11. Total 17.
26. *G. notatus*, fig. 4, 4; fig. 5, 36. Total 40.
27. *G. plagiatus*, fig. 4, 12; fig. 5, 72. Total 84.
28. *G. parrulus*, fig. 6, 2. Total 2.
29. *G. albistylus*, fig. 6, 56. Total 56. In five cases the second postanal cell was divided.

These characters furnish the basis for the following key :

1. Second branch of anal vein not distinctly angulate where the vein between the first and second postanal cells meets it, if this vein meets it at all (Figs. 1-3*a*, pl viii, species 1-16 inclusive; not variable).
 - 1'. Second branch of anal vein not forming any of the boundary of the first postanal cell (Figs. 1-2, species 1 and 2, and 4-16 inclusive; variable).
 - 1''. Only first postanal cell not divided (Figs. 1-1*c*, species 1 and 4-16 inclusive; variable).
 - 2''. First and second postanal cells not divided (Figs. 1*d*, 2, not normal in any species studied; see species 12 and 13).
 - 3''. First, second and third postanal cells not divided (Fig. 2, species 2; not variable).
 - 2'. Second branch of anal vein forming part of the boundary of the first postanal cell (Figs. 3, 3*a*, species 3).
 - 1''. Only first postanal cell not divided (not normal in any species studied; see species 5-7, 9-11 and 13).
 - 2''. First and second postanal cells not divided (Fig. 3, species 3; variable).
2. Second branch of anal vein distinctly angulate where the vein between the first and second postanal cells invariably meets it (Figs. 4-6, species 17-29 inclusive; not variable).
 - 1'. Portion (*s. e.*) of anal vein bounding first postanal cell longer than the portion (*i. e.*) of the second branch of the anal vein bounding the same cell (Figs. 4-5*a*, species 17-27 inclusive; not variable).
 - 1''. Second postanal cell divided (Figs. 4-4*a*, species 17; variable).
 - 2''. Second postanal cell open (Figs. 5-5*a*, 18-27 inclusive; variable).
 - 2'. Portion of anal vein bounding first postanal cell shorter than the portion of the second branch of the anal vein bounding the same cell (Fig. 6, species 28 and 29; not variable).

On the basis of the ratio of the number of wings like figs. 1 and 1*a*, plate viii, to the number like figs 1*b* and 1*c*, species 1, and 4-16 are arranged as follows: *pallidus*, 2-0; *quadricolor*, 5-1; *descriptus*, 8-2; *furcifer*, 3-1; *exilis*, 60-33; *brevis*, 91-49; *graslinellus*, 19-11; *spicatus*, 19-13; *minutus*, 4-3; *sordidus*, 9-9; *abbreviatus*, 9-16; *pulchellus*, 2-4; *militaris*, 0-2; *viridifrons*, 0-5.

On the basis of the ratio of the number of wings like fig. 1 (and 1*a*, 1*b*, 1*c* and 1*d*), plate viii, to the number like fig. 3 (with *s. pa.* divided or not divided), species 1, and 4-16 are arranged as follows: *spicatus* 32-0; *abbreviatus*, 26-0; *furcifer*, 4-0; *militaris*, 2-0; *pallidus*, 2-0; *graslinellus*, 30-1; *exilis*, 93-7; *minutus*, 7-1; *quadricolor*, 6-1; *brevis*, 145-28; *sordidus*, 18-4; *pulchellus*, 6-2; *descriptus*, 10-5; *viridifrons*, 5-3.

On the basis of the ratio of the number of wings like fig. 3, plate viii (with *s. pa.* divided), to the number like fig. 3 (with *s. pa.* not divided), species are arranged as follows: *exilis*, 7-0; *sordidus*, 4-0;

minutus, 1-0; *quadricolor*, 1-0; *descriptus*, 4-1; *viridifrons*, 2-1; *pulchellus*, 1-1; *brevis*, 7-21; *graslinellus*, 0-1.

On the basis of the ratio of the number of wings like fig. 4 (or 4a), plate viii, to the number like fig. 5 (or 5a), species 17-27; inclusive are arranged as follows: *villosipes*, 18-6; *crassus*, 11-12; *externus*, 4-7; *spiniceps*, 6-11; *fraternus*, 13-42; *scudderi*, 4-14; *plagiatus*, 12-72; *notatus*, 4-36; *vastus*, 1-31; *dilatatus*, 0-2; *amnicola*, 0-12.

EXPLANATION OF PLATE VIII.

Figs. 1-6.—Postanal cells of left hind wings of: 1, *G. furcifer*; 1a, *G. pulchellus*; 1b, *G. spicatus*; 1c, *G. pulchellus*; 1d, *G. brevis*; 2, *G. vulgatissimus*; 3, *G. simillimus*; 3a, *G. brevis*; 4, *G. villosipes*; 4a, *G. crassus*; 5, *G. fraternus*; 5a, *G. plagiatus*; 6, *G. albistylus*; f. - - - f, first branch of anal vein; s. - - - s, second branch of anal vein; s', point where vein separating the first and second postanal cells meets the second branch of the anal vein; f. pa. first postanal cell; s. pa. second postanal cell; s. e. portion of anal vein bounding first postanal cell; i. e. portion of second branch of anal vein bounding first postanal cell.

Figs. 7 and 8.—*Gomphus amnicola* Walsh. Rock Island, Illinois, Type 1010, U. S. Nat. Mus. Right second hamule, profile (7) and postero-latero-interaal (8) views.

Fig. 9.—Dorsal view of the male abdominal appendages of *Gomphus notatus* Rambur. Ironton, Ohio, June 1, 1899. R. C. Osburn.

Fig. 10.—Same of *Gomphus plagiatus* Selys. Sandusky, Ohio, July 6, 1899; R. C. Osburn, collector. E. B. Williamson.

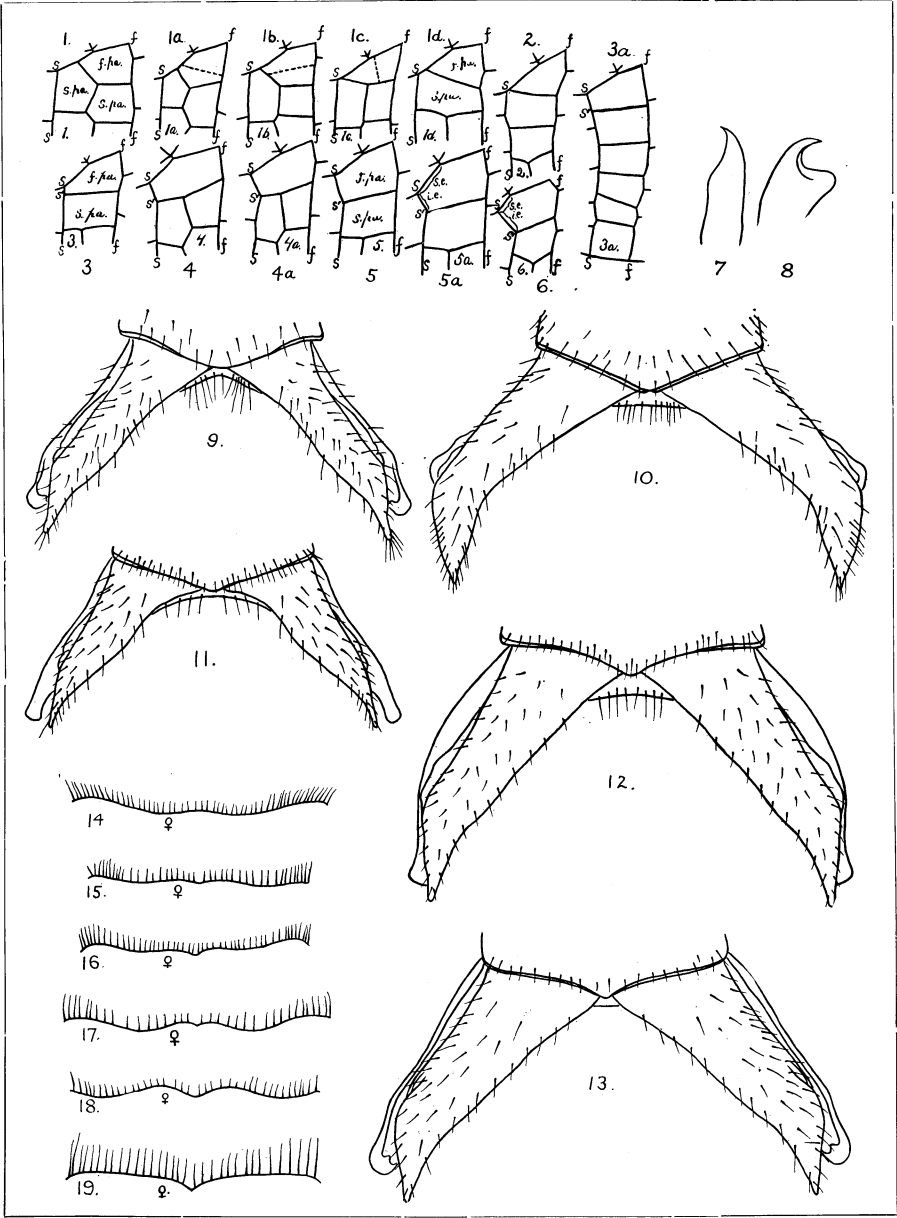
Fig. 11.—Same of *Gomphus amnicola* Walsh. Bethlehem, N. Y., July 6, 1870; Lintner collection. M. C. Z.

Fig. 12.—Same of *Gomphus scudderi* Selys. Russell Stream, Northeast Carry, Maine, August 29, 1899; F. L. Harvey, collector. E. B. Williamson.

Fig. 13.—Same of *Gomphus spiniceps* Walsh. Ohio; J. S. Hine, collector. U. S. Nat. Mus.

Fig. 14.—Occipital crest of female of *Gomphus notatus* Rambur. One of the types of *G. fluvialis* Walsh. Rock Island, Illinois, Type 1009, U. S. Nat. Mus.

Fig. 15.—Same of *Gomphus plagiatus* Selys. Sandusky, Ohio, July 10, 1899. R. C. Osburn.



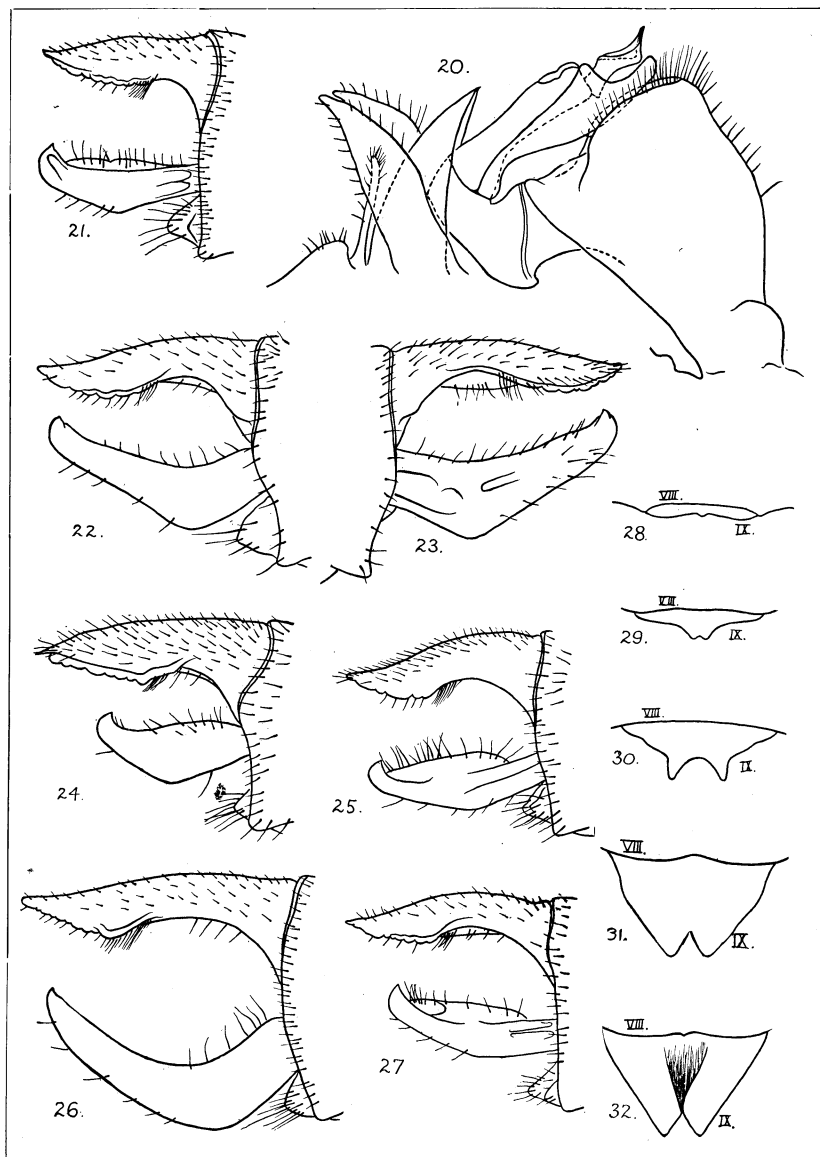


Fig. 16.—Same of *Gomphus amnicola* Walsh. Rock Island, Illinois, Type 1010, U. S. Nat. Mus.

Fig. 17.—Same of *Gomphus notatus* Rambur. Cumberland River, Nashville, Tenn., September 30, 1900. E. B. Williamson.

Fig. 18.—Same of *Gomphus spiniceps* Walsh. Akron, Ohio, September 26, 1897; J. S. Hine, collector. Ohio State University.

Fig. 19.—Same of *Gomphus scudderi* Selys. Northeast Carry, Maine, August 29, 1899; F. L. Harvey, collector. Ohio State University.

EXPLANATION OF PLATE IX.

Fig. 20.—*Gomphus plagiatus* Selys. Accessory genitalia of second abdominal segment of male in detail. Right side, seen in profile. The penis is partly withdrawn from its sheath.

Fig. 21.—Profile view of the male abdominal appendages of *Gomphus amnicola* Walsh. Galina, Illinois; Bean, collector. M. C. Z.

Fig. 22.—Same of *Gomphus spiniceps* Walsh. Same as Fig. 12.

Fig. 23.—Same of *Gomphus spiniceps* Walsh. Quiver Creek, Havana, Illinois, June 23, 1896 (type of *Stylurus segregans* Needham); Needham and Hart, collectors. Professor Needham.

Fig. 24.—Same of *Gomphus plagiatus* Selys. Same as Fig. 14.

Fig. 25.—Same of *Gomphus notatus* Rambur. Same as Fig. 13.

Fig. 26.—Same of *Gomphus scudderi* Selys. Same as Fig. 11.

Fig. 27.—Same of *Gomphus notatus* Rambur. One of the types of *G. fluvialis* Walsh; Rock Island, Illinois. Type 1009, U. S. Nat. Mus.

Fig. 28.—Vulvar lamina of *Gomphus notatus* Rambur. Same as Fig. 25.

Fig. 29.—Same of *Gomphus spiniceps* Walsh. Same as Fig. 24.

Fig. 30.—Same of *Gomphus plagiatus* Selys. Same as Fig. 27.

Fig. 31.—Same of *Gomphus amnicola* Walsh. Rock Island, Illinois. M. C. Z.

Fig. 32.—Same of *Gomphus scudderi* Selys. Same as Fig. 23.